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ABSTRACT

In order not to waste the time of the people working hard and sacrificing to become literate, literacy must offer them a real opportunity to change their life situation. Although many literacy programs are designed to fit the everyday lives and situations of their students, the same is not true for programs that teach arithmetic. Most adults accumulate a considerable store of knowledge and mental techniques to ensure their survival and development, even if that knowledge is not preserved and transmitted by writing. Illiterate people generally have a good knowledge of oral counting, of its mathematical structure, and a certain art of mental arithmetic that is adequate for meeting the needs of their traditional everyday life. Without paper and pencil they can carry out fairly difficult arithmetical operations. The methods used for teaching adults arithmetic should not be those used with young children. Rather, it is a matter of transforming the principal needs felt by the adults into specific educational methods and contents quickly and by going directly to the most essential and useful matters. The tasks of the team responsible for tailoring an arithmetic program to meet a specific case are: (1) to translate acknowledged needs into relevant educational goals; and (2) to define a coherent and effective system of advancement through those goals. (CML)

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LITERACY LESSONS

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INTERNATIONAL LITERACY YEAR

Arithmetic in daily life and literacy

by Claude Dalbéra

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LITERACY? AN ASSET, OTHERWISE NOTHING

Among the few basic principles which are generally acknowledged to contribute to the success of a literacy programme, there is the so-called principle of 'participation'. This involves allowing illiterate persons to express their own views about the contents and methods of the literacy activities which are suggested to them, on the basis, in particular, of their availability and the actual problems of the pupil's daily life. Each step will certainly meet with satisfaction and success if the programme takes into account the fundamental needs felt by the persons and groups concerned, especially in the practical form of teaching new and functional knowledge and skills.

> *What would seem quite certain is that if the goals of literacy work are to mobilize populations, they must be clear, embody good reasons for the illiterate to become active and, more generally, be linked to his aspirations for a better life. ... In practice, the type of participation desired can only be achieved through broad and genuine concertation.*
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> Hamadache, A.; Martin, D. *Theory and practice of literacy work: policies, strategies and examples.* Paris, Unesco; Ottawa, Canadian Organization for Development through Education. 1986, p. 32.

It must be borne in mind that illiterates are mainly concerned with improving their living conditions and protecting their vital interests, if not their very survival. It is impossible for them to willingly devote their time to literacy activities unless they themselves are convinced of their real necessity.

This can be the case with so-called educational activity which does not take into account the aptitudes and knowledge which adults have acquired from their ordi-

nary experiences in personal and community life, and the possible progress – in relation to this knowledge – which can help them advance towards economic, political, social and cultural emancipation. As we know, illiterates constitute a separate category in today's world: they are almost always the poorest people, the most exploited and the most oppressed. They cannot be expected to agree to learn to read and write out of blind loyalty to moral or civic considerations or out of free devotion to some noble cause for their benefit. Literacy should bring them some hoped-for asset which will motivate them. In order not to waste their time, it must offer them a real opportunity to help change their situation. Otherwise, mightn't it actually be better to leave them to their own lives?

READING, WRITING... AND ARITHMETIC? LET'S TALK ABOUT THEM!

We are pleased to note that most literacy workers today are sincerely convinced of the value of 'participation'. Whether one favours the 'awareness' approach or the 'functional' approach, teaching persons to read and write is generally accompanied by relevant thinking about the actual problems faced by illiterates. To be sure, the thematic and methodological choices, and above all their concrete translation into textooks, are always open to discussion. And of course, literacy teachers do not always have the desired training and experience for them to enthusiastically adopt the methods chosen. But the general trend is clear, at least as regards reading and writing as the codification of speech and verbal thought. But what about the reading and writing of numbers? Arithmetic? The problems involved with money, measurements? Simply to ask

these questions can be baffling. There are relatively few literacy programmes which have succeeded in defining methods of learning and thinking in these fields which are adapted to adults. For example, only too often we find literacy programmes which include a highly 'revolutionary' section aimed at providing access to written speech, increasing social awareness, encouraging development, etc., and a highly 'reactionary' section for providing access to written arithmetic: adults find themselves faced with an old-fashioned method directly traceable to traditional primary education, childish and superficially adapted to the environment (marbles have been replaced by eggs to create a 'rural' impression), leading to poor results or none at all (like the performances formerly obtained by the traditional methods of mental arithmetic).

This has sometimes caused adults to abandon their literacy lessons. Faced with such difficulties, therefore, some teachers responsible for literacy programmes simply delete the 'arithmetic' section from their programmes.

Fortunately, as soon as the principle of 'participation' is adopted, illiterates do not hesitate to express their needs loudly and clearly. Many of them pragmatically glimpse in arithmetic that 'big plus' which will lead to their sincere acceptance of the literacy opera-

For the anti-dialogical banking educator, the question of content simply concerns the programme about which he will discourse to his students; and he answers his own question, by organizing his own programme. For the dialogical, problem-posing teacher-student, the programme content of education is neither a gift nor an imposition—bits of information to be deposited in the students—but rather the organized, systematized, and developed 're-presentation' to individuals of the things about which they want to know more.

Freire, P. *Pedagogy of the oppressed.* New York, Herder & Herder, 1970, p. 82.

tion. Some groups even state that learning to count and calculate, and thinking about the important socio-economic problems connected with them, are a matter of high priority for the future of their families and their community. Thanks to these people, arithmetic is still on the agenda when there is any talk of literacy. Hence the importance of keeping the discussion open by exchanging experience and ideas and by spreading new methods. It must be admitted that although literacy in general has generated a great amount of specialized literature, this is not the case with arithmetic in particular. In view of their small number, no particular skill is needed to count the studies devoted to this subject, of which even fewer have been published.

IGNORANT?
LET'S LOOK SLIGHTLY CLOSER

Many persons who have had the opportunity to pass through different grades of formal education have a tendency to consider illiterates as totally ignorant or even as mentally inferior or retarded. Obviously, nothing could be farther from the truth than such a statement. Every living human being who is adult and sound of mind, as well as the society to which he belongs, accumulates *de facto* a considerable store of knowledge

HOW DOES ONE BECOME A FAMOUS EXPERT IN MENTAL ARITHMETIC IN A VILLAGE OF THE SAHEL?

As soon as a child begins to speak, his mother teaches him numbers. She uses a well-tried method: the maternal method. It is a method of incomparable qualities which transforms every daily activity into a learning situation. In their leisure time, the whole family will take part in systematizing and instilling the knowledge which the child acquires. His brothers and sisters will make him count on his fingers, his grandmother will tell him a traditional story to teach him oral numbering. When he has grown a little older, the child will begin to learn many traditional games involving numbers, their uses, tactics and strategies. When he is told to look after the flocks and the farmyard, he will have to classify and count the animals. When he and his little friends pick fruit or hunt small game, he will have to know how to count them. In all cases, he will have to calculate quickly, estimate, verify, divide, multiply, add and subtract mentally. And soon, on market days, his father and mother, who are constantly his careful teachers, will be able to entrust him with increasingly difficult transactions. In this way, even before he has grown up, he will have acquired general principles of mental arithmetic which are useful in his social group. And if he is particularly gifted or interested in arithmetic, he will then have acquired sophisticated techniques of mental arithmetic. He will first gain a reputation in his family, then in his neighbourhood and perhaps even throughout his region. As soon as he has reached an age when everyone has confidence in him, they will all appeal to him to help solve especially complicated problems. He will have become a genuine village expert in arithmetic!

and mental techniques to ensure his survival and development, even if his knowledge is not preserved and transmitted by writing. During the preparation of a literacy programme, if the principle of 'participation' is honestly applied, such a wealth of knowledge will be found as to completely destroy this unfortunate cliché. In the field of arithmetic, the truth of this will be particularly striking.

We are considering the case of illiterate farmers in the Sahel, but this is generally the case of illiterates in all five continents. They have a good knowledge of oral counting (in their own language, of course), of its mathematical structure and a certain art of mental arithmetic, which is fairly adequate for meeting the needs of their traditional everyday life. Without paper and pencil, they can carry out fairly difficult arithmetical operations. For example, for an uneducated farmer it is not necessarily an insoluble problem to know the total value of the sixteen chickens which he is going to sell at the market for seventy monetary units apiece: it is possible that he can even calculate the price in four different ways and give the right amount, even before you and I have time to get out our notebooks, get our pencils out of our pockets, adjust our glasses or scratch our heads trying to remember our multiplication table to figure out 6 times 7. Our illiterate (but to tell the truth fairly clever) farmer will have proceeded as follows: 'One chicken is worth 70, so two are worth 140, four 280, eight 560 (because 200 + 200 = 400, 80 + 80 = 160 and 400 + 160 = 560), and sixteen 1120 (because 500 + 500 = 1000 and 60 + 60 = 120, or 1120 in all)'.

or:

'One chicken is worth 70, so ten are worth 700, five are worth a half less or 350 (because 600 divided by two equals 300 and 100 divided by two gives 50) plus 70, or 1120 in all (because 700 + 350 = 1050 and 1050 + 70 = 1120)'.

or else:

'One chicken is worth 70, so ten are worth 700 and twenty 1400; as two chickens are worth 140 and four 280, and since sixteen is twenty minus four, we only have to take away 280 from 1400 to get 1120 (because 1400 – 200 = 1200 and 1200 – 80 = 1120)'.

Unnecessary, dear reader, to turn to your pocket calculator or look for a sheet of paper to check by your familiar method of multiplication whether the results are correct. The count is exact!

Let us take another example. About some farmers' wives this time. There are seven of them. They have engaged in a joint activity which has earned them a certain amount of money. With this money they have made a purchase of collective interest, but they have 500 monetary units left which they decide to share equally among themselves. What are they going to do? They can use the 'if' method: 'If we were ten women, that would make 50 units apiece, but as we are seven, what we have left to share is 50 + 50 + 50 = 150 units. If we were ten women, that would make 15 more for each of us, but as we are seven, what is left to share is 15 + 15 + 15 = 45. Since 45 is not divisible by ten, we shall divide these 45 units approximately by giving each one 5 units, or for one 5, for two 10, for three 15, for four 20, or for seven 15 + 20 = 35. As there were 45 units left, we still have to share among seven 45 – 35 = 10, or 1 unit for each'. The result of the mental division of 500 by 7 by the 'if' method: 50 + 15 + 5 + 1 = 71 with 3 remaining.

It can be truly stated without contradiction that many illiterates all over the world are better at mental arithmetic than most educated persons, even those of university level. But be assured that probably not all of them are as gifted as our model farmer and his wife! And, of course, their methods will quickly reach their limits if more complex numbers are involved, unless

they are exceptional individuals who are particularly intelligent and well trained. 9

In these conditions, it is understandable that some teachers responsible for literacy classes have reached the disillusioned conclusion that it is better not to overburden the lessons by introducing an arithmetic programme. Especially as it is possible that at the start illiterates may not see any urgent need to learn any methods of arithmetic other than their own. Very often it is hard for them to understand the effectiveness of written arithmetic because they are unfamiliar with how it works. But by applying in depth the principle of participation, and enlightened by dialogue, they can clearly and vividly express the need to write, conscious of the limitations of memory for keeping numbers in mind, for memorizing both daily events involving numbers and figures for mental calculation (in fact, an analysis of operational methods shows that it is the memorization of partial results that constitutes the principal handicap of fully effective mental arithmetic). Moreover, by learning that the word 'arithmetic' constitutes an introduction to the international systems of measurement (volume, weight, time, etc.), men and women who lack a good knowledge of these systems will be more eager for such education.

In the Sahel, in particular, the impact of modernization has caused much concern to the villagers, who fear, not unreasonably, that advantage is being taken of their ignorance of legal measures to rob or humiliate them, which for persons with an inbred sense of dignity can be taken as a real moral insult. Moreover, their growing inclusion in a monetary-type economy also brings with it needs connected with money: receipts, invoices, deposits and withdrawals at banks, or even co-operative accounting. It is evident that an arithmetic

programme will seldom be superfluous if it tries to meet the everyday needs of adults.

From this point of view, of course, this does not mean teaching illiterates the rudiments of written arithmetic based on the programmes of children's primary education, in the unsubstantiated belief that this might be of use to them. It is rather a matter of transforming the principal needs felt by them into specific educational methods and contents, and by going directly to the most essential and useful matters. And quickly, for adults have only a limited amount of time for learning. With them, it is not possible, as it is at the school level, to put off the acquisition of more satisfying skills to a later time. Especially since the mastery of arithmetic offers new practical tools which can supplement the mental techniques already used by illiterates. Both to save time and to be realistic, it is necessary to start from what the adults already know, and enable them in this way to develop their ability to cope with their problems themselves.

Our experience of teaching mathematics to adults enables us to state that you must take account of two basic assumptions for this type of education:

- **Time:** *adults have very little time available to train themselves, both from the point of view of their daily schedule and from the point of view of the length of the course. This constraint is important, and you must be very strict to avoid the progress of the teaching course being deflected by concerns which have nothing to do with the results being sought.*
- **Experience of daily life:** *it is not possible to undertake any training whatsoever without taking account of the experience and lives of adults. Overlooking this experience often leads to failure, even if the training content is technically pertinent. Furthermore, adults will not be satisfied with knowledge which does not lead to a substantial improvement in the way they carry out mathematical calculations at present.*

Girodet, M.A. *Calculs écrits, données culturelles et alphabétisation.* Paris, Unesco, 1983 (ED 83/WS 117).

As a result, it is at the level of the social, culturally homogeneous group that the necessary work must be done for drawing up programmes: linguistic and social research in particular and consultation with the public targeted by a literacy campaign, as well as with all the public or private persons with whom adults have to do – not forgetting future literacy teachers!

An arithmetic programme to fit each special case, therefore, but one largely aimed at a collective case.

SOME EDUCATIONAL GOALS CONNECTED WITH ACTUAL SITUATIONS

To translate acknowledged needs into relevant educational goals – this is the primary task of the team responsible for tailoring an arithmetic programme to meet a specific case. Let us take an example: the need to note numbers, generally from one to five figures, in order to retain them in one's memory, or to read numbers, generally from one to six figures in various documents, forces one to learn to read and write *all* numbers. After all, there is no point in limiting oneself to the first one hundred numbers, as would be the case in the first year of primary school for children, since adults usually have to deal every day with numbers of more than two figures. Another example: farmers who have to estimate the surface of their gardens and fields in square metres, *ares* (100 square metres) or hectares need to be taught a simple way to calculate this area by using adapted units. In this case, there is no point in teaching adults the whole theory of the metric system. It is even better to define the units in a general and 'realistic' way. For example, the metre could be

described as 'a long step which never varies', regardless of the height of the person making the measurement, of an equal length regardless of the village, region or country, and which can be expressed by various invariable objects, such as sticks, wooden rulers, ribbons, chains, surveyor's tapes, etc. Thus, the *are* can be described as a part of real and visible areas, ten metres by ten metres, which can be physically measured in a real and larger area: the field.

The whole problem involves proceeding in such a way that each educational goal representing a need should be achieved, if not completely, then at least for practical purposes. For example, if it is decided that the written addition of several numbers of two to five figures is a very useful tool, the necessary classes will be exclusively devoted to this until the adults have actually mastered this operation so that they can use it when needed. This approach is radically different from that of child pedagogies, where usually numeration, operations and measurements are taken up almost simultaneously, by first working with small numbers and ideas which are considered 'easy', and then with increasingly large numbers and increasingly difficult ideas, without any thought for the immediate use of the skill outside the education system.

THE SECRET OF RAPID PROGRESS? RELY FIRST ON ACQUIRED EXPERIENCE

The second crucial task confronting the team responsible for tailoring an arithmetic programme for special cases is to define a coherent and effective system of advancement. This means setting a reasonable number of goals, with due regard for the time available (often only about fifty hours in the classroom and just as many 'in the field'), classifying them by order of functional priority (in relation to the needs of daily life) and by order of teaching priority in relation to learning requirements. Subsequently, the work is planned in units such that at every meeting the teacher relies both on the knowledge acquired by the pupil before literacy (oral numeration, mental arithmetic, traditional systems of measurement) and on the knowledge acquired during the preceding lessons (reading and writing figures and numbers, addition, etc.).

The more the teacher relies on the adults acquired experience, the easier it will be to plan new learning lessons intelligently, and the less one introduces into each work unit elements which are not directly useful for the results sought for, and the more likely advancement will be rapid, since each of the programmed goals can then be achieved in a minimum time. Experience also shows that much time can be saved if everything concerning so-called instrumental knowledge (numeration and written calculations) is reserved for classroom work, and if the teacher himself visits the actual sites (fields, workshops, building sites, stores) and personally sees the things which have to do with practical knowledge (weights, bookkeeping, different measurements, surveying, etc.). Of course, the practical lessons will closely follow the progress made in the classroom so

that the pupils can re-use the knowledge thus acquired, and vice versa.

> *An adult has conceived a system for solving the principal problems which he meets and for explaining the world in which he lives. It is seldom that he has not learned, by his own efforts, what he considers indispensable in his own life.*
>
> *This is why adult basic education, even when the student is highly motivated, is always a painful experience.*
>
> *Nevertheless, we can be sure that if it is not based on what the student already knows, or thinks he knows, and if he is incapable of using what he learns in relation to what he already knows, his education will fail or will continue to have no impact on his actual behaviour.*
>
> Calcul et raisonnement mathématique
> Liaison committee for literacy and advancement, Paris, 1979, 1986 (new edition)

CONCLUSION: SHOULD WE TEACH LITERACY IN OTHER WAYS? IT IS ALSO POSSIBLE IN ARITHMETIC!

This approach via practical goals, mobilizing all the adults' resources, may naturally be disconcerting to an educator accustomed to traditional teaching methods. But we must emphasize, and act upon, the fact that adults are not children. It must be acknowledged that such an approach has proved effective in several particularly innovative programmes for elementary arithmetic on all five continents. Yes, it is possible to break clearly away from primary school courses for children and be guided as closely as possible by the combined assets and specific constraints of adult education.

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To educate an adult is not just to transmit what the educator knows himself, but to try to help another human being to solve a certain number of his own problems as well as possible and by his own means.

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The International Bureau of Education acknowledges with grateful thanks this contribution by Claude Dalbéra to the cause of Literacy. Mr. Dalbéra is the former head of the functional literacy programme of the non-governmental organization 'Frères des Hommes', and a former literacy expert in the Directorate for Training Young Farmers of the Government of Burkina Faso. At present, he is a general delegate of the Liaison Committee for Literacy and Advancement in Paris, which represents 125 associations for the campaign against inadequate education in France.

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